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AUTHOR Kallingal, Anthony
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ABSTRACT

The effect of verbal and numerical reasoning and effort level on achievement of students in an undergraduate Test and Measurement course was investigated. Course achievement was measured by a teacher-made test of 40 items that produced a mean of 21.33 and a standard deviation of 6.73. The ability scores of the 24 students (Chamorros, Filipinos and Statesiders) on a test of 25 items covering numerical reasoning and verbal reasoning correlated with achievement scores with a coefficient of .77 and the self-ratings on effort with achievement scores with a coefficient of .53. It was found that low-ability students in the sample exerted less effort than the high-ability students and, therefore, that both ability and effort had a depressing effect on the achievement of low-ability students. Reasoning ability was found to be about 5 times more important than effort in achievement. Contains 5 references. (KM)

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CRITICAL FACTORS IN COLLEGE LEVEL COURSE ACHIEVEMENT

By Anthony Kallingal

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ABSTRACT

This study investigated the effect of verbal and numerical reasoning and effort level on achievement of students in an undergraduate Test and Measurement course. The course achievement was measured by a teacher-made test of 40 items which produced a mean of 21.33 and a standard deviation of 6.73. The ability scores of students on a test of 25 items covering numerical reasoning and verbal reasoning correlated with achievement scores with a coefficient of .77 and the self-ratings on effort with achievement scores with a co-efficient of .53. It was found that low ability students in the sample exerted less effort than the high ability students and, therefore, both ability and effort had a depressing effect on the achievement of poor students. Reasoning ability was found to be about five times more important than effort in achievement.

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PROBLEM

The final report of the Study Group on the Conditions of Excellence in American Higher Education sponsored by the National Institute of Education (1984), stated that excellence in higher education requires that institutions of higher education produce demonstrable improvements in student knowledge, capacities, skills and attitudes. Adëquate measures of educational excellence must be couched in terms of student outcomes rather than institutional characteristics. Much is known about the conditions under which student learning can be maximized. However, the report notes, colleges and universities rarely seek and apply this knowledge in shaping their educational policies and practices.

Out of the three critical conditions of excellence proposed by the study group, the most important for purposes of improving undergraduate education is student involvement. How much time, energy and effort students devote to the learning process? The efficiency of this involvement depends on the abilities

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of students. Ability and effort level are crucial for attaining high academic standards.

Bloom (1982) theorizes that three interdependent variables are central in explaining much of the variation in academic achievement. These are: 1. The cognitive ability of students, 2. Motivational level as manifested in their effort, and 3. Quality of instruction. Cognitive ability is a very broad concept and includes many skills one of which happens to be verbal and numerical reasoning. This study sought to determine the relative influence of two variables of reasoning ability and effort on academic achievement in a senior college level course. The specific questions addressed in the study were:

1. How much of the variance in academic achievement is explained by numerical and verbal reasoning ability and effort?
2. How much is the unique contribution to achievement variance from each of the variables?
3. Do low ability students put forth greater effort than high ability students so as to make up for their deficiency?

PROCEDURES

The study sample consisted of twenty-four (24) students enrolled in ED 489 Evaluation during the Fall Semester 1988. Although not a random sample, the group may be considered typical seniors in the College of Education at the University of Guam and, therefore, the conclusions from this study may safely, though cautiously, be generalized to other seniors in the College. The students in the course came from diverse ethnic backgrounds. There were Chamorros, Filipinos and Statesiders in the sample. The results of the study have, therefore a cross-cultural significance.

The study focussed on the achievement of students in the course as measured by an examination made up of forty (40) multiple choice items covering three

broad content areas of basic concepts in measurement, aspects in planning teacher-made tests, and principles of item construction. The items covered not only recall of concepts and principles learned in the course, but also higher level thinking skills of application, analysis, comparison and critical evaluation. The content coverage and the cognitive tasks that the items require on the part of the students argue for the validity of the test. The reliability estimated by Kuder-Richardson formula 21 reached a high value of .75 which is generally considered high for a teacher-made test.

The study sought to relate student achievement to two factors: their verbal and numerical reasoning ability and effort level. The reasoning ability was measured by a test of twenty-five (25) multiple choice items compiled by the researcher from a variety of group intelligence tests. The items in the cognitive abilities test covered processes of logical and analytical thinking in numerical reasoning and verbal reasoning. The following are illustrative items from the test.

1. A carpenter has a 12-foot board. How many cuts must he make to cut it into 3 equal parts?

   a. 1 b. 2 c. 3 d. 4 e. None of these

2. John is the fifth child from each end of a row. How many children are in this row?

   a. 5 b. 9 c. 10 d. 11 e. 12

3. A man who died in 1913 at the age of 42 had lived just twice as long as his twin brother. If the man was married two years after his twin brother's death, in what year was he married?

   a. 1890 b. 1892 c. 1894 d. 1911 e. None of these

The Kuder-Richardson Formula 21 reliability of the reasoning test was .74. The second predictor variable of the study was the effort on the part of students in studying the subject matter of the course and was measured by student self-ratings. The students were asked to rate themselves on a scale

of 1 to 9 on the extent to which they prepared for the examination. The researcher assumed honesty and accuracy in student self-ratings. However, it should be noted that some may intentionally report low effort level so as to avoid shame. When one reports low effort level, poor performance can be attributed to low effort, which is less shameful in our society than is low activity (Corrington and Omelich, 1979).

The data on the three variables in the study were numerically summarized into means, standard deviations and intercorrelations. Multiple regression and correlation techniques were used to determine the overall impact of the predictor variables on academic achievement. Effort ratings of high ability students were compared with those of low ability students by a t-test on the difference in mean achievement scores. Those who scored above the mean in the verbal and numerical reasoning test scores were considered high ability students and those below as low ability students.

RESULTS

The measurement results on three variables in the study are summarized in Table 1. The range in the values of self-ratings on effort was restricted with minimum being 3 and maximum being 9. It should be borne in mind that correlations computed from values with restricted range tend to be generally lower than what they should really be. In orther words, Pearson r will underestimate the real relationship between variables when the variability is small. This should be taken into account when interpreting the relationship of effort with the other two variables.

Table 1

Mean and Standard Deviation on
Ability, Effort and Achievement

VARIABLE	MEAN	STANDARD DEVIATION
Ability	11.67	4.63
Effort	5.79	1.47
Achievement	21.33	6.73

The interrelationships among achievement, ability and effort are presented in Table 2.

Table 2

Correlations Among Achievement, Ability and Effort

	ACHIEVEMENT	ABILITY	EFFORT
Achievement	1.00	.77	.53
Ability		1.00	.46
Effort			1.00

It should be noted that a high positive correlation between ability and effort is counterproductive for maintaining high levels of achievement. High correlation between ability and effort indicates that as the ability increases, effort level also increases and as ability decreases, effort level also decreases. When ability is low, a correspondingly high level of effort is needed to maintain higher levels of achievement. A deficiency in ability can be made up only by greater effort. However, what is observed in the sample is just the opposite. Those with high levels of ability put forth greater effort than those with low ability. The low ability students seem to engage in naturally convenient avoidance behavior. They avoid effort in learning the material of the course. The comparison of the average ratings of the high ability group on effort with the average of low ability group confirmed this finding.

The t-test on correlations showed that all three correlations were statistically significant beyond five percent error level. Statistical significance

refers to the generalizability of correlation from sample to population and should not be confused with substantive significance which refers to the extent to which one variable explains the other variable. The square of the correlation coefficient, r, indicates the proportion of variance in one variable that is explained, accounted for, or predicted from the variance in the other variable. In our example, the correlation of .77 between achievement and ability shows that 59 ($.77^2$) percent of the differences in achievement is associated with the differences in ability. Similarly, twenty-eight percent of achievement is accounted for by effort and the differences in effort level are explained by differences in ability to the extent of twenty-one percent. All of these percentage variance explanations would be considered substantial.

The first research question was concerned about the extent to which achievement can be explained by the two variables of reasoning ability and effort level. The regression equation to predict achievement from the two predictor variables turned out to be $Y = 3.88 + .84X_1 + 1.32X_2$. The accuracy of prediction is given by multiple correlation which turned out to be .79. The square of the multiple correlation gives the percentage of achievement variance that is explained by the two variables. Sixty two percent of the variance in achievement was explained by reasoning ability and effort level.

The second question addressed in this study centered on the unique contribution of the two predictor variables of ability and effort. How much ability contributes to achievement if all were to have the same level of effort? How much effort contributes to achievement if all were to have the same ability level? These questions were answered by means of partial correlations. Partial correlation estimates the relationship between two variables after removing the effect of a third variable on both variables being correlated.

The partial correlation between ability and achievement after removing the variance contribution of effort on both, turned out to be .70. The original correlation between ability and achievement before extracting the common variance of effort was .77. There was a slight decrease in that correlation when the effect of effort was removed. The partial correlation between effort and achievement while holding ability constant turned out to be .31. The original correlation was .53. The square of the partial correlation tells the unique influence of each variable on achievement. Forty-nine percent ($.7^2$) of the variance in achievement could be attributed to ability whereas only about 10 percent ($.31^2$) could be attributed to effort of the students in the study sample. The reasoning ability of students had an impact 5 times greater than that of effort level on the achievement differences. This finding seems to point out that improvement in academic achievement by increasing the effort level alone of the students would be limited. Improvement in thinking skills would probably increase academic standards substantially.

The last question dealt with relative effort level of high and low ability students. The average score of the class on the ability test was used as a cut-off score to separate the students into high and low ability groups. There were thirteen in the high group and eleven in the low group. In order to find whether low ability students tend to make up for their weakness in ability by extra effort, the mean scores of the two groups on effort were compared and tested for statistical significance. The high group had a mean score of 6.15 and the low group a mean of 5.36. In other words, the high ability group put forth greater effort in studying for the test than the low ability group. This finding is contrary to what was expected. The expectation was that low ability students were aware of their weakness in ability and would make up for it by extra effort. The

difference in mean scores on effort in favor of the high ability group was not statistically significant and, therefore, high ability students may not always put forth greater effort than low ability students. However, there is no evidence that low ability students put forth greater effort to make up for their weakness and, as a result, the ability as well as the effort level have a depressing effect on achievement score.

SUMMARY AND CONCLUSIONS

The study analyzed: 1. the relationship of reasoning ability and effort with achievement; 2. the relative effort level of low and high ability students. The correlations among the three variables were all significantly high, with the correlation between reasoning ability and achievement being the highest with a value of .77 and the correlation between ability and effort being the lowest with a value of .46. Cognitive ability is more important than effort in academic achievement. However, both are needed in maintaining high academic standards. Surprisingly, the low ability students had a lower motivational level as manifested in their effort to study the material in the course. Although ability is more important in academic achievement than effort, effort can contribute significantly to achievement. Unfortunately the low ability students seem to ignore this. They were less conscientious in their study than their counterparts with high ability. Thus, the achievement of these students plummeted to extremely low levels due to the deleterious effects of low reasoning ability and low effort level. The linear regression equation for predicting academic achievement from ability and effort demonstrated that effort could increase achievement.

The analysis of the unique contribution of reasoning ability and effort towards achievement by means of partial correlations revealed that reasoning

ability was about five times more important in academic achievement than effort on the part of the students, thus pointing a need to implement programs for improving thinking skills as well as maintaining a high level of student effort in studying. Can thinking skills of college students be improved? Mulcahy, Kifi, Peat, Andrews and Clifford (1986) think so. These researchers have identified a number of thinking strategies that could be specifically taught through repeated practice with different classes of problems. Dansereau and his associates (1985) developed a program to teach a number of cognitive strategies to college students. The acronym for the program is MURDER, formed from the underlined letters in the description of the procedures. Set your Mood; read for Understanding; Recall; Digest information by means of rehearsing, organizing and storing; Expand knowledge through a process of self-inquiry; and Review. Studies of this experimental program at the college level have generally shown increases in measures of cognitive functioning. Perhaps a project can be set up to implement that program on the campus.

Can we maintain a high level of student effort in college courses? I think so. Theoretically, it would be a lot easier to work on student effort than on cognitive skills. A large number of steps might be taken to ensure productive effort levels from students such as a clear and unambiguous statement of student expectations in terms of specific knowledge and skills, an abundance of appropriate student assignments and lab activities to supplement quality instruction, effective monitoring of assignments and activities possibly with the help of graduate assistants, required prereading of the material before class discussion, stricter attendance requirements, well-developed tests for evaluating student growth, reasonable standards for passing, opportunities for retaking equivalent tests until desired levels of competency are demonstrated, and finally making

sure that students do not overextend themselves by taking too many courses. A concerted college level effort is needed to implement these strategies.

The overall conclusion of this study is that student involvement on the part of many students is alarmingly low. One reason seems to be their low reasoning ability. High reasoning ability students generally put forth greater effort than the low ability students. An attempt to improve reasoning skills might, therefore, increase student involvement. The need to improve reasoning skills was evident in the conclusion that they are five times more important than effort. This information has curricular implications. Programs to improve reasoning skills should be a part of the undergraduate college curriculum in order to maintain high academic students.

REFERENCES

1. BLOOM, Benjamin S., (1982). Human Characteristics and School Learning, McGraw-Hill Book Company, New York.

2. COVINGTON, M.V. and Omelich, C. L. (1971). Effort: The double-edged sword in school achievement. Journal of Educational Psychology.

3. DANSEREAU, D. F., (1985). Learning Strategy Research. In J. W. Segal, S. F. Chipman, and R. Glaser (Eds.) Thinking and Learning Skills, (pp. 209-240), Hillsdale, N. J., Earlbaum.

4. MULCAHY, R., Kofi, M., Peat, D., Andrews J., and Clifford, L., (1986 Spring), Applying Cognitive Psychology in the Classroom: A Learning/ Thinking Strategies Instructional Program. Alberta Psychology.

5. Study Group on the Conditions of Excellence in American Higher Education, Involvement in Learning: Realizing the Potential of American Higher Education, National Institute of Education, Washington, D. C., 1984.